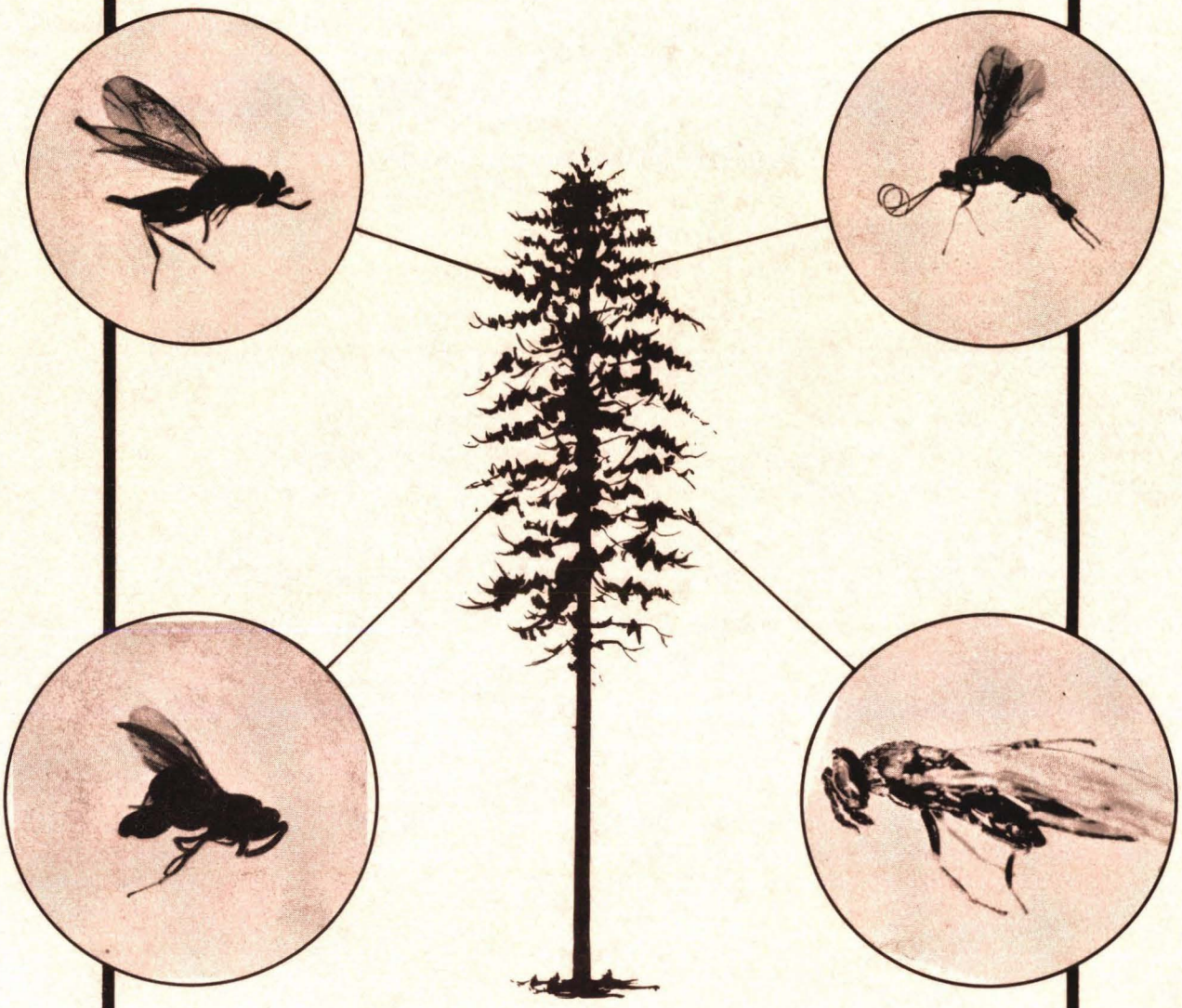
SB761
U7N6
72-4

MARCH 1972

Distribution of

LARCH CASEBEARER PARASITES

in the Crowns of WESTERN LARCH TREES IN THE Northern Region



U. S. Department of Agriculture – Forest Service
Division of State and Private Forestry Northern Region
Missoula, Montana

REPORT NO. 72–4

5200

1972

ROCKY MOUNTAIN STATION

Cover Pictures

Starting at upper left and reading clockwise, common parasites associated with the larch casebearer in the Northern Region: *Mesopolobus* sp., *Agathis pumila*, *Dicladocerus* sp. near *westwoodii*, *Spilochalcis albifrons*.

DISTRIBUTION OF LARCH CASEBEARER PARASITES IN THE CROWNS OF WESTERN LARCH TREES IN THE NORTHERN REGION

by

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ABSTRACT

A study was made to determine the distribution of parasites of the larch casebearer, *Coleophora laricella*, within crowns of western larch, *Larix occidentalis*. The most common parasites recovered in order of their abundance, were: *Agathis pumila* (Ratz.), *Dicladocerus* sp. near *westwoodii*, *Spilochalcis albifrons* (Walsh), and *Mesopolobus* sp.

Parasitism by *A. pumila* was significantly higher in the outer limbs of the upper one-third of the crown. *Dicladocerus* sp. near *westwoodii* was highest on the inner branch portions regardless of crown level. *S. albifrons* parasitized more casebearers on the lower-outer portion of the crown. Parasitism by *Mesopolobus* sp. was uniform throughout the crown.

INTRODUCTION

Parasites of the larch casebearer, *Coleophora laricella* Hbn., help keep populations at low levels (Denton, 1964). Since 1957, this insect has reached epidemic proportions in northern Idaho, eastern Washington, and western Montana, and has spread throughout the western larch, *Larix occidentalis* Nutt., type in these areas. To date, parasites have not conspicuously altered the trend of casebearer infestations in western States, even though 19 species of native hymenopterous parasites have been recovered and one exotic species was introduced in 1960 (Bousfield and Lood, 1972). The three most common species collected were *Spilochalcis albifrons* (Walsh), *Dicladocerus* sp. near *westwoodii* Westwood, and *Agathis pumila* (Ratzeburg). *S. albifrons* parasitized 53 percent of its hosts in one area in northern Idaho (Bousfield and Lood, 1971), and the senior author has made collections from one tree in Sandpoint, Idaho, where 95 percent of dissected casebearers contained *A. pumila*.

Since little is known about within-tree distribution of parasites, it is difficult to develop adequate sampling procedures. The objective of this study was to determine the distribution of the more common parasites in typical sample trees and to determine if these parasites show a preference for different portions of the crown. This would provide data to improve sampling methods to evaluate the impact of the current parasite complex of the larch casebearer.

METHODS

Thirty-seven trees infested with larch casebearer were selected in northern Idaho, western Montana, and eastern Washington and sampled in early June when the larch casebearer was in the pupal stage. Sixteen of these trees were from four areas where *A. pumila* was previously released. The trees ranged from 30 to 40 feet in height with full crowns. Five entire branches were removed from the lower, mid, and upper crown levels of each sample tree. These branches were cut in half to represent lower-inner, lower-outer, mid-inner, mid-outer, upper-inner, and upper-outer portions of the crown. Each half-branch section was cut into smaller pieces and packaged in a paper bag. Five samples were obtained for each portion of the crown. Bags of foliage were returned to the laboratory. From each branch section 25 casebearer pupae (or as many as could be found) were removed. Each pupa was placed in a gelatin capsule and 25 capsules were stored in a Petri dish. Each dish was labeled as to location, tree, crown level, and inner or outer branch sample. The pupae were kept at room temperature until casebearer moths and parasites emerged. Each capsule was then inspected to determine if a moth or parasite had emerged from the pupa case. Parasites were identified and recorded. Because humidity and temperature could not be regulated in the rearing room, many parasites (especially *A. pumila*) and casebearer moths died before emerging. These unemerged pupal cases were soaked in 10 percent KOH until their contents could be seen and identified.

Data were summarized by totaling parasites and moths both emerged and unemerged from the 125 pupal cases collected from five branch sections. These were then converted to percentages for statistical analyses.

RESULTS

Four species of hymenopterous parasites common to the three crown levels sampled were: *Agathis pumila* (Ratzeburg), Family: Braconidae; *Spilochalcis albifrons* (Walsh), Family: Chalcidae; *Dicladocerus* sp. near *westwoodii* Westwood, Family: Eulophidae; and *Mesopolobus* sp. Family: Pteromalidae. Other species of parasites recovered were responsible for 1 percent or less parasitism of *C. laricella* and have been submitted for identification.

Total parasitism varied from 20.8 percent at lower crown to 24.4 percent at top crown in the outer portions of sampled trees. Parasitism ranged from 16.0 percent at lower crown to 23.8 percent at top crown in samples from branches from the inner crown portion of trees sampled. Total parasitism was heavier in the outer portions of sample trees (Table 1).

Table 1.--Percent parasitism by four parasites of the larch casebearer by crown level.

Parasites	Crown level					
	Upper		Mid		Lower	
	Inner	Outer	Inner	Outer	Inner	Outer
Agathis pumila	18.300	19.987	16.775	18.431	10.175	14.831
Spilochalcis albifrons	.815	1.232	.803	1.416	1.586	2.957
Dicladocerus sp. near *westwoodii*	3.346	1.599	2.932	1.597	3.372	1.918
Mesopolobus sp.	.829	1.644	1.070	.575	.873	1.143
Total percent parasitism by crown level	23.805	24.462	21.580	22.019	16.006	20.849

The following comments concern the parasite complex and distribution within trees from which parasites were recovered:

Analysis of variance showed a highly significant variation in *A. pumila* populations between crown levels (Table 2). Parasitism was highest in the upper one-third of the crown, decreased at midcrown, and was lowest at bottom crown. Numbers of *A. pumila* were significantly higher in the outer branch portions of all three crown levels. Significant difference was found in *A. pumila* parasitism between trees.

Table 2.--Analysis of variance showing distribution of *Agathis pumila* in western larch.

Source of variation	D.F.	M.S.	F.
Crown level	2	388.289	12.643*
Branch portion	1	170.400	5.548**
Between tree	15	3220.900	104.878*
Residual	77	30.710	

* Significant at .01 confidence level.
** Significant at .05 confidence level.

Parasitism by *S. albifrons* was significantly higher in lower crown samples. The least amount of parasitism occurred in the upper crown. A highly significant difference in parasitism occurred between the inner and outer branch samples. Parasitism of *C. laricella* by *S. albifrons* was higher in the outer branch samples (Table 3). Percent parasitism differed at the .01 confidence level between trees.

Table 3.--Analysis of variance showing distribution of *Spilochalcis albifrons* in western larch.

Source of variation	D.F.	M.S.	F.
Crown level	2	35.010	8.785*
Branch portion	1	34.616	8.686*
Between tree	35	15.126	3.795*
Residual	177	3.9850	

* Significant at .01 confidence level.

Analysis of variance showed a highly significant difference in parasitism by *Dicladocerus* sp. near *westwoodii* between inner and outer branch samples. Parasitism was heavier on the inner branch portions of the crown. No significant difference in parasitism was found between the three crown levels sampled (Table 4). Parasitism between trees was highly significant for *Dicladocerus* sp. near *westwoodii*.

Table 4.--Analysis of variance showing distribution of *Dicladocerus* sp. near *westwoodii* in western larch.

Source of variation	D.F.	M.S.	F.
Crown level	2	2.608	.419
Branch portion	1	123.412	19.853*
Between tree	35	71.156	11.446*
Residual	177	6.2162	

* Significant at .01 confidence level.

No significant difference in parasitism by *Mesopolobus* sp. was found between crown levels or between inner and outer branch samples (Table 5). Between-tree parasitism differed at the .05 level.

Table 5.--Analysis of variance showing distribution of *Mesopolobus* sp. in western larch.

Source of variation	D.F.	M.S.	F.
Crown level	2	3.096	1.116
Branch portion	1	2.092	.745
Between tree	35	6.674	2.406*
Residual	177	2.7737	

* Significant at .01 confidence level.

DISCUSSION AND CONCLUSIONS

A. pumila accounted for the highest percent parasitism, followed by *Dicladocerus* sp. near *westwoodii* and *S. albifrons*, with *Mesopolobus* sp. responsible for the least amount of parasitism.

The data indicates *A. pumila* prefers the upper-outer portion of larch infested with casebearers. *S. albifrons*, instead, parasitized more casebearers on lower-outer portion of the crown. *Dicladocerus* was heaviest on the inner branch portions of the entire crown, and *Mesopolobus* was evenly distributed throughout the crown (Figure 1).

There was a significant difference in percent parasitism between trees. This can be explained due to the fact that the 37 sample trees were obtained from nine different areas. Measurement of between-tree variation within an area was not the objective of this evaluation.

LITERATURE CITED

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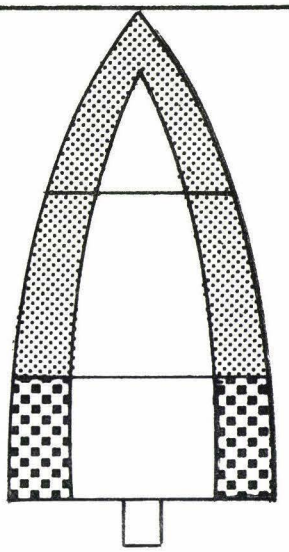
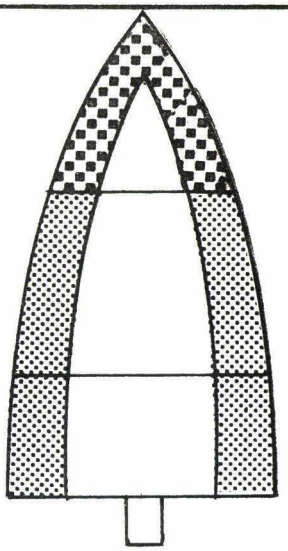
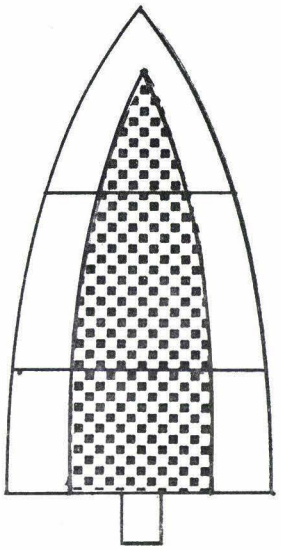


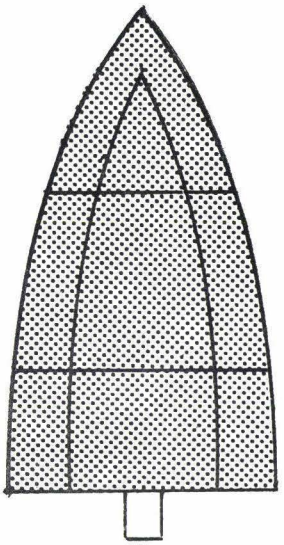
Spilochalis albifrons



Agathis pumila



Dicladocerus sp. near westwoodii



Mesopolobus sp.

Figure 1.--Distribution of four parasites of the larch casebearer within the crowns of western larch.

Portion of the crown most preferred by parasite.

Other portions of crown which parasite showed some preference for.